The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

SURFACE VEHICLE RECOMMENDED PRACTICE

Submitted for recognition as an American National Standard

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(R) OIL-TEMPERED CHROMIUM-VANADIUM VALVE SPRING QUALITY WIRE AND SPRINGS

1. Scope—This SAE Recommended Practice covers the mechanical and chemical requirements of oil-tempered chromium-vanadium valve spring quality wire used for the manufacture of engine valve springs and other springs used at moderately elevated temperatures and requiring high fatigue properties. It also covers the processing requirements of spring fabricated from this wire.

2. References

2.1 Applicable Documents—The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply.

2.1.1 SAE PUBLICATION—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

HS 84—Manual on Shot Peening

2.1.2 ANSI PUBLICATION—Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ANSI B32.4M—Preferred Metric Sizes for Round, Square, Rectangle, and Hexagon Metal Products

2.1.3 ASTM PUBLICATIONS—Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM A 232—Specification for Chromium-Vanadium Alloy Steel Valve Spring Quality Wire
ASTM A 232M—Specification for Chromium-Vanadium Alloy Steel Valve Spring Quality Wire (Metric)

3. Wire

3.1 The wire shall conform to the oil-tempered requirements of ASTM A 232/A 232M.

3.2 Special Surface Inspection—When specified, the entire length of every coil used by engine valve spring manufacturers shall be inspected for surface imperfections with a magnetic and/or eddy current defect analyzer or equivalent.

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4. Springs

4.1 Heat Treatment—Springs coiled from this wire shall be stress relieved for a minimum of 30 min at heat unless otherwise agreed upon by purchaser and supplier. Normally the temperature used will be the maximum which will leave the original hardness of the wire essentially unchanged. Typical temperatures are 370 to 430 °C (700 to 800 °F).

4.2 Hardness—Hardness of springs shall be measured on suitable ground flats for wire sizes 1.6 mm (0.062 in) and larger, or on ground-mounted sections for wire sizes of less than 1.6 mm (0.062 in). Hardness values shall conform to Table 1A or 1B.

4.3 Surface Condition—Coiling marks or nicks which flatten but do not gouge the specified wire diameter by more than 1% or that would not impair the serviceability of the parts are permitted.

4.4 Shot Peening—When specified, valve and other high fatigue requirement springs shall be shot peened to a minimum of 90% coverage on the inside diameter of the springs (reference SAE HS 84). After shot peening, the springs shall be stress relieved at a temperature of 200 to 245 °C (400 to 475 °F).

5. Notes

5.1 Marginal Indicia—The (R) is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. If the symbol is next to the report title, it indicates a complete revision of the report.

PREPARED THE SAE IRON AND STEEL TECHNICAL
COMMITTEE DIVISION 17—SPRING WIRE

TABLE 1A—HARDNESS[1], SI UNITS

	Wire Diameter[2] mm	Min	Max
R 15N	0.50	88.5	89.7
	0.80	88.0	89.3
	1.00	87.5	88.8
	1.40	86.9	88.3
R 45N	1.60	57.9	61.4
	2.00	56.4	59.4
	2.50	55.0	57.9
RC	3.50	48	51
	4.00	47	50
	5.00	46	49
	6.00	45	48
	8.00	43	47
	11.00	42	45

Values for intermediate sizes may be interpolated.

1 Hardness ranges indicated apply to finished springs and are subject to normal variations found in standard hardness testing procedures.

2 Preferred sizes. For a complete list refer to ANSI B32.4M.

TABLE 1B—HARDNESS[1], INCH-POUND UNITS

	Wire Diameter in	Min	Max
R 15N	0.020	88.5	89.7
	0.032	88.0	89.3
	0.041	87.5	88.8
	0.054	86.9	88.3
R 45N	0.062	57.9	61.4
	0.080	56.4	59.4
	0.105	55.0	57.9
RC	0.135	48	51
	0.162	47	50
	0.192	46	49
	0.244	45	48
	0.283	44	47
	0.312	43	47
	0.375	43	46
	0.438	42	45
	0.500	41	45

Values for intermediate sizes may be interpolated.

1 Hardness ranges indicated apply to finished springs and are subject to normal variations found in standard hardness testing procedures.